AHMEDABAD UNIVERSITY
School of Engineering and Applied Science
2026-Winter

ENR310 Fluid Mechanics and Convective Heat Transfer
Mid-Term Examination
Wednesday, 25 February 2026, 5:00 - 7:00

Name:	Roll no.	A	U	2							Marks /35

Instructions:

- All questions are compulsory.
- Figures to right indicate full marks.
- Wherever there is a need, sketch the figure.
- Assume suitable data wherever necessary and specify it clearly in your answers.

Questions:

Q.1a. The deformation of the fluid per unit length is called as: [1 Marks]
A. Stress
B. Elasticity
C. Strain
D. None of these

Q.1b. Which of the following statement is correct? [1 Marks]
A. In a compressible flow, the volume of the flowing liquid changes during the flow.
B. A flow in which the volume of the flowing liquid does not change, is called incompressible flow.
C. When the particles rotate about their own axes while flowing, the flow is said to be rotational flow.
D. all of the above

Q.1c. The given continuity equation is valid for [1 Marks]

$$\nabla . V = 0$$

A. Ideal fluid flow only
B. Incompressible fluids, whether the flow is steady or unsteady
C. Steady flow, whether the fluid is compressible or incompressible
D. Incompressible fluids and steady flow only

Q.1d. In the case of steady and uniform flow, the total acceleration is [1 Marks]
A. Constant
B. Variable
C. zero
D. Never zero

Q.1e. The component of acceleration due to non-uniformity of flow is called [1 Marks]
A. Normal acceleration
B. Tangential acceleration
C. Convective acceleration
D. Local acceleration

Q.1f. During motion, a fluid element is stated to undergo a change in angle between two adjacent sides when it moves from one place to another. This type of motion is called ..... [1 Marks]

Q.1g. The path traced by a single particle of smoke issuing from a cigarette is a..... [1 Marks]

Q.1h. Streamline, streakline and pathline are identical when ..... [1 Marks]

Q.2a. Is specific weight an absolute quantity? It is defined as: [1.5 Marks]

$W = \gamma =$ .....

In which unit we measure the specific weight?

Q.2b. What is the unit of Relative density? It can be defined as: [1.5 Marks]

Relative density = ...

Relative density is also known as.....

Q.3a. Three liters of petrol weights 23.7 N. Calculate the mass density (in kg/m^3), specific gravity, specific weight (in kN/m^3), and specific volume (in m^3/kg) of the petrol. [4 Marks]

A. 805, 0.805, 7.9, 1.242×10^{-3}

B. 0.805, 805, 7.9, 1.242×10^{-2}

C. 805, 0.805, 7.9, 1.242×10^{-2}

D. None of the above.

Note: Show a detailed solution to the problem on the answer sheet for grading. Correct choices without a detailed solution will not be accepted.

Q.3b. The space between two parallel plates kept 3 mm part is filled with an oil of dynamic viscosity 0.2 poise. The shear stresses on the fixed plate, if the upper one is moving with a velocity of 90 m/min is ..... [2 Marks]

A. 50 N/m^2

B. 10 N/m^2

C. 15 N/m^2

D. 30 N/m^2

Note: Show a detailed solution to the problem on the answer sheet for grading. Correct choices without a detailed solution will not be accepted.

Q.4. If for a two-dimensional potential flow, the velocity potential is given by

$$\phi = x\,(2y - 1)$$

Determine the resultant velocity at the point P (4, 5). Determine also the value of stream function ψ at the point P. [8 Marks]

Q.5. On the given fluid element, apply the x-momentum balance and obtain the Cauchy momentum equation for the x-component. Also, specify the physical significance of each term in the obtained equation. [10 Marks]

